ELEC-204 HW-1 Barış Kaplan/69054

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(1) The course textbook, and

(2) The lecture notes self-taken or distributed by the instructor

I have not used, accessed, received or distributed any information from/to any other unauthorized source in taking this assignment. The effort in the assignment thus belongs completely to me."

Signature = B.Kaplan

Question-1

⇒ This pulse waveform is periodic.

⇒ For a duration of 4 ms, one wave is created.

$1\,ms = 10^{-3}\,s$

$4\,ms = 4 \cdot 10^{-3}\,s$

$\text{Frequency} = f = \frac{1}{T} = \frac{1}{4 \cdot 10^{-3}}\,Hz$

$\frac{1}{4 \cdot 10^{-3}}\,Hz = 250\,Hz$

$\Rightarrow \frac{1}{4} \cdot \frac{1}{10^{-3}} = \frac{10^3}{4} = \frac{1000}{4} = 250\,Hz = f$

$$\text{Duty cycle} = \left(\frac{t_w}{T}\right) \cdot 100\%$$

$T = \text{Period} = 4\ ms = 4 \times 10^{-3}\ s$

$t_w = 2\ ms = 2 \times 10^{-3}\ s$

$$\text{Duty cycle} = \left(\frac{2 \times 10^{-3}\ s}{4 \times 10^{-3}\ s}\right) \cdot 100\% = \frac{1}{2} \cdot 100\%$$

$$\text{Duty cycle} = 50\%$$

$\Rightarrow$ Yes, the digital waveform shown below can be called a pulse train. Square waves are actually types of pulse trains. Square waves are pulse trains which have rectangular shape and which have duty cycles of %50.

Question-2

The total serial transfer time for the eight bits $\Rightarrow 8 \times 1\ \mu s = 8\ \mu s = 8 \times 10^{-6}\ s$ //

The bit sequence represented by this form:

$\Rightarrow 10101110$

The total parallel transfer time:

$\Rightarrow \frac{8\,\mu s}{8} = 1\,\mu s = 10^{-6}\,s$ (when all of them are parallel)

Question-3

a) Adder function

b) Multiplier function

c) Multiplexer function

d) Encoder function and Comparator function

Question-4

$1\,kHz = 1000\,Hz = 10^{3}\,Hz$

$\Rightarrow 20\,kHz = 20000\,Hz = 2 \times 10^{4}\,Hz$

$1\,ms = 0.001\,s = 10^{-3}\,s$

$\Rightarrow 40\,ms = 0.040\,s = 0.04\,s = 4 \times 10^{-2}\,s$

$\Rightarrow Period = T = \frac{1}{f} = \frac{1}{20000} = 0.00005\,s$

$\Rightarrow$ Let m be the number of pulses which are counted during 40 ms.

$$m = \frac{(4 \times 10^{-2})\ s}{(5 \times 10^{-5})\ s} = \frac{4}{5} \times 10^{3} = \frac{4000}{5}$$

$$m = \frac{4000}{5} = \underline{800 \text{ pulses.}}$$

So, 800 pulses are counted during 40 ms.